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Synopses

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Oral Health Needs of Special Needs Children in Brisbane

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Abstract

This study was a retrospective analysis of dmf/DMF and erosion scores within two groups of special needs children of ages five years and twelve years. Data was gathered on a data capture form designed with relevant questions, which would be flexible in the data gathering process. Data was gathered by the searching of patient notes. Observation of treatment sessions and questioning of clinical and non-clinical staff helped to formulate my impression of the department, how treatment is delivered and to whom it is delivered.

Children in the five-year-old group had the highest experience of dental disease when compared with the twelve-year-old group. Children with medical and congenital special needs comprised the largest number of children in both groups. As yet there is no formal facility to record erosion lesions within the oral examination dental charting system of the Royal Children's Hospital of Brisbane.

No differences exist in the delivery of dental care and treatment between indigenous and non-indigenous children. Treatment can be given to any eligible child and all cleft lip and palate cases are referred to the Royal Children's Hospital within the state of Queensland.

Introduction

The elective study was undertaken in Australia at the Queensland Health, Royal Brisbane Hospital Children's Oral Health Service. The Oral Health Service is located on level 5 of the Coles' Health Services Centre, Royal Children's Hospital Herston Road, Herston, Brisbane, Queensland. This facility is part of a busy Children's Hospital, which serves the population of Brisbane, (a large city on the east coast of Australia) and surrounding areas and receives children from all areas of Queensland as well as referrals to certain specialities from other Australian states, including New South Wales and the Northern Territory.

This location was chosen due to my interest in children's oral health care, the reputation of the Royal Children's Hospital and the design of the survey itself. Because the survey involved children with special needs, and because DMF/dmf scores were being assessed, it was important that a suitable facility was chosen. The Royal Children's is a major centre for cleft lip and palate cases and all cases within the state of Queensland are referred, as indeed are many from other states, to the Royal Children's Hospital. The intention of the study was also to look at the methods, management and provision of oral health care and to see if any differences existed in the care provided between children of indigenous and metropolitan communities.

Arrangements in the first place were made with Dr. Steve Atkin, the director of the children's oral health service and then full arrangements were made regarding the duration, timing, data collection requirements etc. with Dr. Kerrod Hallett, the tutor responsible for overseeing the elective.

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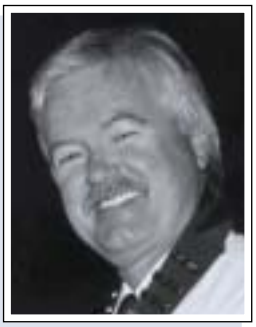

President's Report

Since my last report, a number of branch and council activities have occurred. I was able to visit New Zealand branch in April, or was it the North Island sub branch, and present two half-day courses in Whangerai and Hamilton. Both meetings were well supported and it was pleasing to see a large contingent of public school dental nurses as well as private dentists in the audience. It would appear that both meetings were quite successful and that the local branch finances have benefited considerably from the presidential visit. My sincere thanks to all concerned for organising the program.

More recently, the federal council of ANZSPD met prior to the 30th Australian Dental Congress in Brisbane. A number of important issues were discussed and our hard working secretary, Dr Alistair Devlin, will summarise the salient points elsewhere in this publication. Our bank balance was significantly boosted by the profit generated from the last convention in Adelaide and it was decided to transfer the bulk of this money into a short term investment account to improve the interest return and to maintain ease of access for future education projects. A travel fellowship to assist an Asian or South Pacific dentist to attend future ANZSPD and IAPD meetings is being considered and suitable candidates will need to be recommended. Council fully endorsed the current IAPD presidential drive to increase voluntary IAPD membership from within the region and an IAPD application form has been produced by Dr J Winters for distribution to all branch secretaries. There has been an encouraging response from the West Australian members to date. In addition, the ANZSPD council has agreed to nominate Dr J Chan from Hong Kong for the position of IAPD Representative of Nations.

A number of constitutional changes have been investigated to facilitate incorporation of the federal body of ANZSPD. The difficulty is how to incorporate a body that has branches in six states and two countries. It was agreed by council that the society should incorporate in West Australia. Accordingly, a new constitution that complies with the regulations of the West Australian Department of Fair Trading will need to be arranged. A special general meeting of ANZSPD will be held in Hobart on 3 November, after the R K Hall visiting lecture program on that day. All members will be circulated with the proposed changes prior to the meeting and are invited to attend. Those unable to be there will have the opportunity to vote by proxy or by postal vote.

Special General Meeting of ANZSPD to be held in Hobart on 3 November

The ANZSPD essay competitions for 2001 have also been finalised with the following topics determined by council: Postgraduate - "Discuss alternative modalities in the diagnosis and management of early carious lesions" and Undergraduate - "Discuss the application of psychological theories in the behaviour management of the paediatric patient". I ask all academic members to encourage their respective students to enter the contest. This annual competition is becoming very popular and provides program directors with a useful assessment instrument.

The Early Childhood Caries theme symposium held during the recent ADA congress was well supported and provided an opportunity to highlight the ongoing problems of this ubiquitous childhood disease. The financial assistance from Colgate Oral Care in sponsoring both interstate speakers to attend the meeting is gratefully acknowledged. Our last national educational activity planned for 2001 is the R K Hall visiting lecturer, Dr Luc Martens, in November. All day meetings are planned for Auckland, Christchurch, Hobart, Sydney and Perth to allow as many members as possible to benefit from this educational program. I look forward to speaking with Victorian and Tasmanian members later this year.

Finally, my sincere congratulations to Bill Wilson for his recent OAM in the Queen's birthday honours. Bill was in private paediatric dental practice in Brisbane for many years and maintained a voluntary dental service to the Montrose home for crippled children, as it was known during this period. I have asked Bill for further information regarding this activity so that a full report can be published in Synopses at a later date.

Warmest Regards

Kerrod B Hallett

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Objectives of Project

The purpose of this elective study encompasses three main areas. Firstly by the collection of data from dental records a retrospective assessment of the dmf/DMF scores and presence of erosion within a small sample of special needs children aged 5yr and 12yr was to be carried out. Secondly to gain first hand insight into the dental care of children including those with special needs, within an Australian community. Thirdly to gain knowledge of the methods, management and provision of dental care and of any differences in provision of care between metropolitan and indigenous children.

Methods and Materials

A data capture form was formulated to include patient details such as age of patient, sex, initials and patient number and date of birth. There were 9 categories of special needs included within the capture form. These categories are adapted from and include the categories of special needs recognised as those that exist for the 11 groups of disabled children for whom special schools exist within Britain. The purpose of grouping together some of the special needs categories was to take into account the possibility that the degree of severity of disability might not be fully recorded within the medical note taking system of the RCH dental notes. For example, where those with defects of vision may be considered as partially blind or blind, for the purpose of this study, both categories were classed together as visual defect.

The 11 categories of special needs recognised in Great Britain[1] are as follows.

Table of special needs categories for which special schools exist

1	Blind	7	Maladjusted
2	Partially Blind	8	Physically Disabled
3	Deaf	9	Epilepsy
4	Partially Deaf	10	Speech disorder
5	Educational subnormal	11	Mentally handicapped
6	Delicate		

Delicate includes those with medical disabilities such as congenital heart disease and cystic fibrosis. Mentally handicapped applies to those for whom independent living is impossible and those with limited learning potential. Maladjusted includes those with behavioural difficulties. Physically disabled are those disabled by such illnesses as polio and muscular dystrophy. The next table represents the special needs categories that the data capture form contained. There are 9 categories represented and this represents all the special needs from the aforementioned 11 recognised categories for which special schools are run within Great Britain.

Table of Special Needs Categories Represented on the Data Capture Form

1	Medical/ Congenital	6	Mental/Educational Impaired
2	Visual Defect	7	Physically Impaired
3	Hearing Defect	8	Maladjusted
4	Speech Defect	9	Epileptic
5	Other		

dmf/DMF Parameter

The dmf/DMF scores were simply recorded numerically in data boxes adjacent to the descriptor for that score. Two rows on the form were used for this with dmf on the top row and DMF on the bottom row. This was a simple and easy method of recording the relevant data.

Erosion Score

Erosion has been traditionally a difficult factor to quantify and score and various systems exist. The inclusion of the facility to record erosion lesions in the project was of interest as often those children with special needs are prone to erosion assaults on the dentition. It was also of interest to see if patients who were noted to have erosion lesions actually had the lesions charted in any way and how that was achieved.

The data capture form included two yes/no answer boxes for whether erosion was present or not in the patient notes and whether it was charted formally or not as part of a chart or measuring system within the patient notes. This method of data collection was thus able to take into account the possibility that although erosion may have been mentioned, a formal system of recording it might not be in wide use at the RCH. However, also on the form, a dental cross chart was included to record the "Teeth Involved" thus being able to demonstrate if at least an area of eroded dentition had been recorded by the RCH. Finally, "Tooth Surfaces" was the last parameter that was represented on the form. Here, labial, buccal and occlusal surfaces of eroded teeth could be recorded and also whether they were on upper or lower dentition. This method of data collection was designed to be broad and flexible and may have allowed for various different forms of erosion data that the RCH may have had in use.

Results

The Five Year Old Group

There were a total of 22 subjects in the 5-year-old sample group. All of these subjects were 5 years of age and had an up to date dental chart completed from a dental recall/review appointment or hospital ward admission dental examination. There were a total of 12 male subjects and 10 female subjects, see fig 1.

Special Needs Categories

There were a total of 19 patients with medical or congenital problems. One patient had a hearing defect. Two patients had other special needs, and two patients had mental or educational impairment. Finally, there was one patient who had behavioural problems that was maladjusted. No patients were epileptic, physically impaired or had a visual defect.

Because several of the patients had multiple problems, the total percentages of special needs within the sample group do not reflect the total number of patients, see fig 2. Thus, within the special needs categories, the relative percentages of special needs occurring within the group are as follows. Medical/congenital represented 76% of the special needs. Mental/educationally impaired and other special needs each represented 8% of the special needs. Hearing defects and maladjusted each represented 4% of the special needs totals.

dmf Score

In the 5-year-old group, a total of 21 teeth were actively diseased. There were 68 teeth extracted and missing due to caries. A total of 134 teeth were filled but otherwise sound, see fig 3, 4 and 5. No children in the 5-year-old sample group had diseased, missing or filled permanent first molars. The average dmf scores for the five year olds was 0.95 diseased, 3.09 for the number of missing due to decay, and 6.1 for the number of filled otherwise sound teeth, see fig 6.

Erosion Charting

Erosion lesions were not recorded, mentioned or charted in any of the 22 five-year-old sample group children chosen for this study. Therefore no tooth surfaces in the upper or lower dentition were recorded as being eroded.

The Twelve Year Old Group

There were a total of 22 subjects in the twelve-year-old sample group. There were 13 males and 9 females in total. Eight children were aged 12 and the others in the group varied between age 13 and 21. Dental records were complete for all the children. In the case of the 12 year olds within the group recent up to date dental charts were used either from review/recall appointments or hospital admission dental assessments. For the rest of the group who were older than 12, records were taken from their dental charts from when they were age twelve.

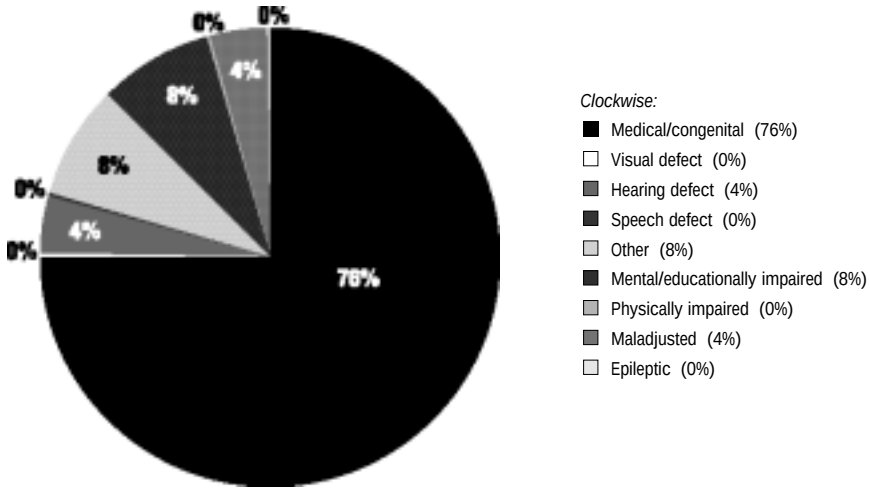
Special Needs Categories

A total of 18 patients had a medical/ congenital condition, two had a visual defect, and one had a hearing defect. A total of eight patients were mentally/ educationally impaired, one patient was physically impaired, and five patients were epileptic. No patients in this group had speech defects or other special needs and none were maladjusted.

Because several of the patients had multiple problems, the total percentages of special needs within the sample group do not reflect the total number of patients. Thus, within the special needs categories, the relative percentages of needs occurring within the group are as follows. Medical/ congenital represent 51% of the special needs. Mental/educational impaired represent 23% and epileptics represent 14%. Visual defects represent 6% and hearing defects and physically impaired each represent 3%. Speech, other special needs and maladjusted were not represented within the 12 year old sample group, see fig 7.

Fig 1 Total numbers of males and females for the 5 year old sample group

Fig 2 Relative percentage of special needs occurring within the 5 year old group



dmf/DMF Scores

The total dmf scores within the 12-year-old group were eight diseased teeth, four teeth missing due to decay and 25 teeth filled but otherwise sound. The total DMF scores were seven teeth diseased, ten teeth missing due to decay and 42 teeth filled but otherwise sound, see fig 8, 9, 10 and 11.

The average dmf scores within the 12-year-old group were 0.36 diseased, 0.18 missing due to caries and 0.14 teeth filled but sound. The average DMF scores within the group were 0.32 diseased teeth, 0.45 teeth missing due to decay, and 1.91 teeth filled but sound, see fig 12.

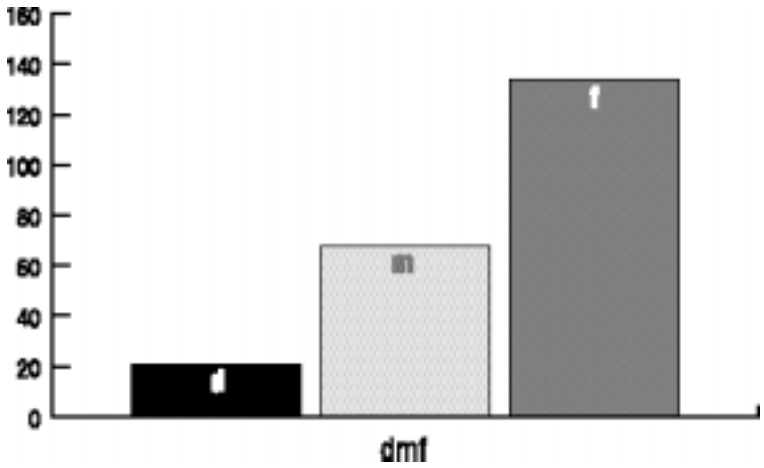
Erosion Charting

Erosion was recorded in the dental notes of 1 patient within the 12-year-old group (patient no. 15). The dental charts indicated that the dentition involved was the primary dentition and included the following teeth. 5-4, 6-4, 7-3, 8-3, and 8-4. However, no reference was made to the specific tooth surfaces involved. The remaining 21 patients had no erosion lesions recorded or charted.

Fig 3 Conditions in Five Year Old Sample Group

Pat No	Date of Birth	Age	Sex	Condition
1	031094	5	M	Behavioural
2	141294	5	F	Asthma
3	180994	5	M	Autistic
4	220894	5	M	Cardiac, croup, asthma
5	170195	5	M	Asthma
6	100894	5	M	Asthma
7	040894	5	M	Asthma
8	210195	5	F	Cardiac murmur, asthma
9	151094	5	M	Pierre-Robin syndrome, grommet placement, hyperactive
10	040894	5	M	Bilateral inguinal hernia repair, child taken into care
11	300794	5	M	Biliary atresia, eczema, epistaxis
12	130495	5	F	Cerebral palsy, GORD
13	250994	5	F	Cardiac murmur
14	310894	5	F	Multiple cardiac, nil spleen, kidney dis, coeliacs,
15	200195	5	F	Cardiac
16	040894	5	M	Down's syndrome, cardiac, pneumonia, obstructive sleep apnoea
17	020595	5	M	Asthma
18	181194	5	M	Cardiac murmur, asthma
19	050794	5	F	Argyles syndrome, cardio pulmonary disorder
20	071294	5	F	Warferinised, heart valve replacement, asthma
21	300894	5	F	Epidermolysis bullosa simplex, asthma
22	130295	5	F	Asthma

Fig 4 Total dmf scores for the 5 year old sample group



Discussion

Five year old sample group

The sample was made up of 12 males and 10 females thus a total of 22 subjects were in the group, see fig 1. There was no significant difference between the number of males and females in the group as proven by an F-test score of 1.

Though 19 of the 22 patients had a medical or congenital special need, many of the patients had multiple problems. This thus alters the overall relative percentages of special needs represented.

In the 5-year-old group, three patients had active decay, 14 patients had teeth missing due to decay and 16 patients had filled but sound teeth. As no 5 year olds had any permanent dentition present, no scores were taken for DMF. As 21 children out of the sample had some decay experience, the proportion of children with any known decay experience in the five-year-old sample group was thus 95.45%. This is a very high figure and is indeed more than twice the decay experience of children in the same age group recorded by the last UK national child dental health survey figures for England and Wales in 1993. However, this high decay experience is probably due to the children in the sample group having special needs. Many of the children (19) had serious medical or congenital disabilities and indeed, several of the group had mental health/educational special needs. These groups of children are vulnerable to higher decay levels and this is reflected in the decay experience of this group of Australian children. Drinking water in Brisbane is non-fluoridated and a bid to fluoridate the water was rejected on the 10th of January 1997.

The proportion of children with active decay, however, was only 13.64%, with the mean number of decayed teeth per child being 0.95, a very low figure in comparison to the “any known decay experience” and also when compared to active decay in other countries. The 1993 UK survey quotes a figure of 38% for active decay, which is nearly three times higher than the sample from Brisbane. The reasons for this low active decay can be put into perspective when considering the percentage of teeth filled but otherwise sound. The percentage of children with filled teeth in the Brisbane sample group was 72.73%, with the mean number of filled teeth per child being 6.09. These figures could be a reflection of the philosophy by which dentistry operates in the RCH Brisbane. There may be an emphasis on early intervention and conservation of the primary dentition within the Australian setting, and certainly dental caries is dealt with early, both clinically and for the child, at the earliest possible biological stage of development. Also, children are seen meticulously regularly for recall and review appointments and therefore there is a high level of understanding and cooperation from the parents, guardians and carers of these children, a high level of oral health awareness and a keen interest in conserving and restoring their children’s teeth.

Twelve Year Old Sample Group

The sample group was made up of 13 males and 9 females thus again the sample contained 22 subjects, see fig 13. There was no significant difference

between the numbers of males and females as proven by an F-test score of 1.

Again though a high number of patients (18) had medical or congenital special needs, many of the patients had multiple special needs and the relative proportion of special needs in total reflects this.

In the 12 year old group, three patients had actively decayed primary teeth and three had missing primary teeth due to caries. Also there were seven patients with filled but otherwise sound primary teeth. In the permanent dentition, three patients had active dental caries, five patients had missing permanent teeth due to caries and 11 patients had filled but otherwise sound teeth.

Because 11 out of 22 patients in the sample had some known decay experience in the primary dentition, 50% therefore had experienced decay in the primary dentition. The percentage of children with decay experience in the permanent dentition was 72.73%. Again these are high figures for decay experience and possibly reflect the fact that the sample group consists of children who have special needs, there being a high level of medical/ congenital and also mental and educational special needs children within the group. Though these figures are high, they do represent a reduction in the overall decay experience in comparison to the five year old group. This may be partly attributable to better oral hygiene awareness and practice being imparted to parents, guardians and carers, and indeed may be due to the children themselves gaining better understanding and ability to maintain oral hygiene. The proportion of children with active decay was 13.64% for both the primary and permanent dentition. This represents a mean number of decayed permanent teeth per child of 0.32. These figures compare with active decay in the five year old group and again are possibly due to early intervention against carious lesions. This is born out by the relatively high proportion of children with filled but sound teeth. The proportion of 12 year olds with filled permanent teeth was 50%, with the mean number of teeth filled per child being 1.91, while the proportion of children in the sample with filled primary teeth was 31.64%, with the mean number of filled primary

Fig 5 Relative dmf scores for the 5 year old sample group

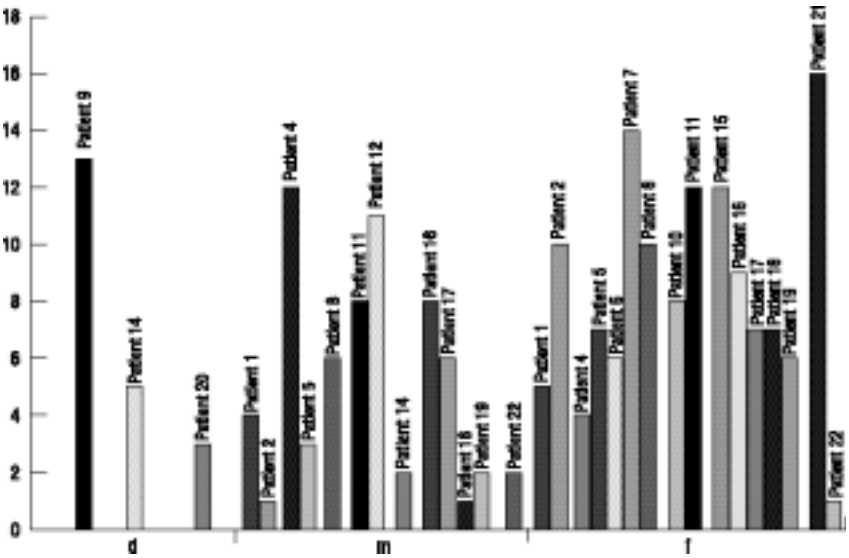


Fig 6 Average dmf scores for the 5 year old sample group

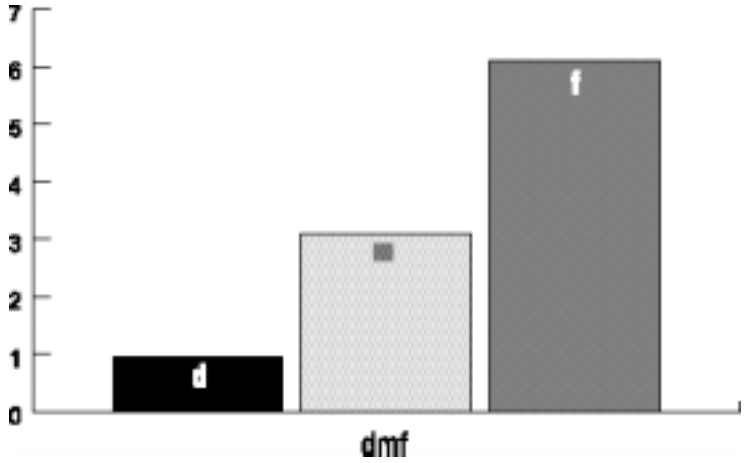
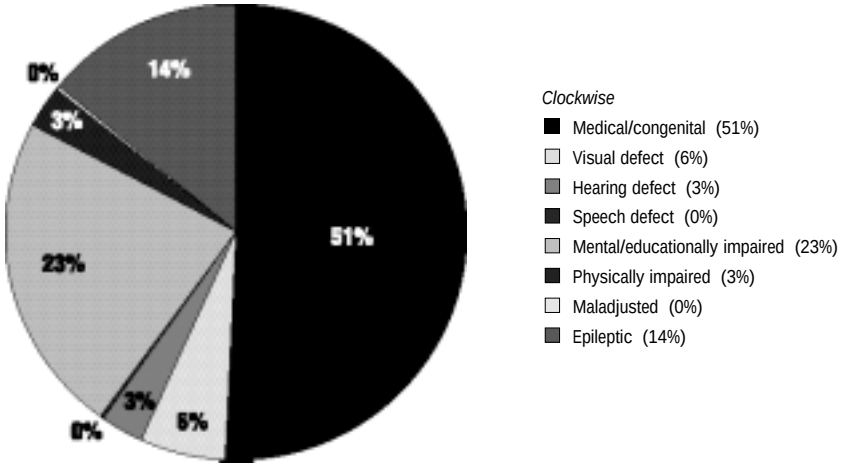


Fig 7 Relative percentage of special needs occurring within the 12 year old group



teeth per child being 1.14. These figures also represent a reduction in dmf scores over the 5-year-old group, and again are perhaps due to the factors mentioned previously. The mean number of permanent teeth missing due to decay was 0.45 per child.

Erosion discussion

Despite the fact that during the data gathering process, a great many dental charts were assessed belonging to patients with gastro oesophageal reflux disorder, only one child was recorded as having an erosion lesion within the sample group for 12 year olds. However, only two patients with GORD within the total 44 patients had suitable charts from which data was gathered. This was due to the age of the patients not falling within the study requirements, or due to in-complete records. For the patient who was included and had erosion lesions, though the site of the erosion and the teeth affected were recorded and charted on the dental chart, there was no reference to the surfaces of the teeth involved nor to what extent erosion had taken place. At present, the RCH dental charting system does not have the facility to chart erosion lesions, except by annotation. No descriptors or coding system for erosion lesions is presently in use at the hospital. However, Dr. Kerrod Hallett, a senior dentist responsible for the medical needs children and those admitted to the wards at the RCH, is in the process of researching suitable charting systems to be included in the dental charting system. One possible system that could be adapted for use in the department is a system which exists for assessing erosion lesions of incisors. This system looks at the buccal and lingual surfaces of primary and secondary maxillary incisor teeth for loss of surface enamel characteristics and/or exposure of dentine or pulp. It is the depth and area of the incisors involved which is assessed by using the following criteria.

Fig 8 Conditions in 12 Year Old Sample Group

Pat No	Date of Birth	Age	Sex	Condition
1	050482	18	M	Dystrophic dwarfism
2	181186	13	M	Charge syndrome
3	171086	13	M	Haemophilia A, hepatitis A & C
4	090778	21	F	Asthma, agoraphobia
5	150787	12	F	Epilepsy
6	030687	12	F	Asthma, epilepsy
7	260198	12	F	Down's syndrome, cardiac defects
8	301087	12	M	Spina bifida, cardiac defects
9	190488	12	F	Gastro oesophageal reflux disorder
10	150687	12	M	Down's syndrome
11	211082	17	F	Moebius syndrome
12	230484	16	F	Severe chronic depression, taking lithium
13	221081	18	M	Cardiac defects & murmur, asthma
14	010586	14	M	Pierre-Robin syndrome
15	231085	15	M	Ectodermal dysplasia
16	260281	19	M	Cystic fibrosis, asthma
17	010184	16	F	Spina bifida, cardiac defects
18	260884	15	M	Bardet-Biedls syndrome, asthma
19	181082	17	F	Epilepsy
20	250485	15	M	Haemophilia A
21	090588	12	M	Autistic & developmental delay
22	130887	12	M	Noonans syndrome, neurofibromatosis, asthma, cyclical vomiting

Fig 9 Total DMF scores for the 12 year old sample group

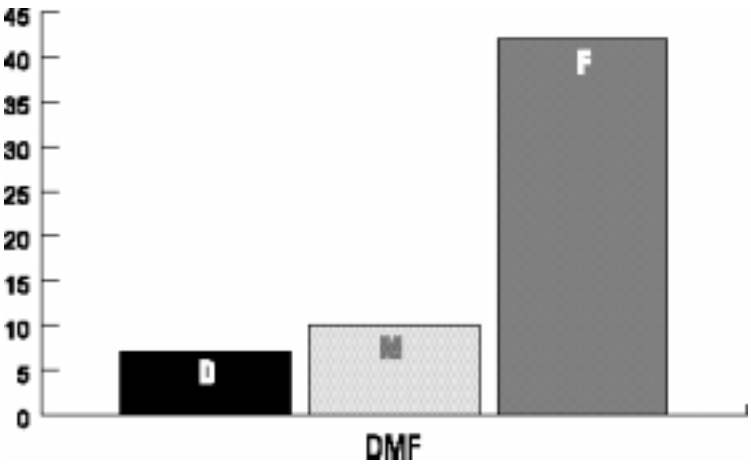
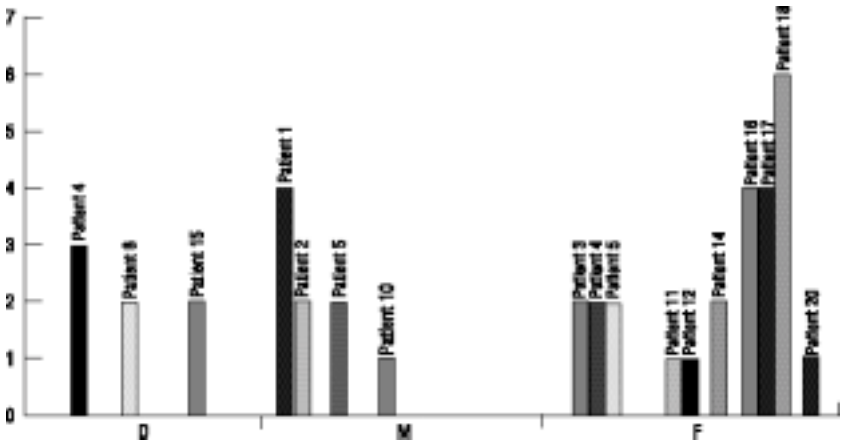


Fig 10 Relative DMF scores for the 12 year old sample group



Depth

- Code 0 Normal
- Code 1 Enamel only, loss of surface characterisation
- Code 2 Enamel and dentine, erosion lesion into dentine
- Code 3 Enamel into pulp, erosion of enamel, dentine and pulp exposure

Area

- Code 0 Normal
- Code 1 Less than one third of surface involved
- Code 2 One third, up to two thirds of surface involved
- Code 3 More than two thirds of surface involved

Such a system could possibly be modified and adapted for use at the Royal Children's Hospital and put into wide use there, especially as many cases going through the RCH are special needs children with gastric problems including reflux disorders.

Conclusions

It can be concluded from the results of the data collection that the five year old special needs children had a higher disease experience than the children in the twelve year old group with the five year olds having decay experience of 95.45%, and the twelve year olds having decay experience of 72.73%. Better plaque control, dexterity, diet and understanding on the part of the twelve year olds and their guardians, may be important factors contributing to the difference in decay experience between these two groups.

Prevention, conservation and early intervention are key watchwords at the Royal Children's Hospital. This can be seen as both groups have a comparably low number of actively decayed teeth, approximately 0.32 teeth per child. The number of restored but sound teeth per child is higher, the five year olds having a score "f" of 6.09 teeth filled per child, and the twelve year olds having a score "F" of 1.91 teeth filled per child. Preventive dentistry is thoroughly promoted in the department. The proficiency certified Dental Assistants take a major responsibility in dental health education and full use is made of the

Fig 11 Relative DMF scores for the 12 year old sample group

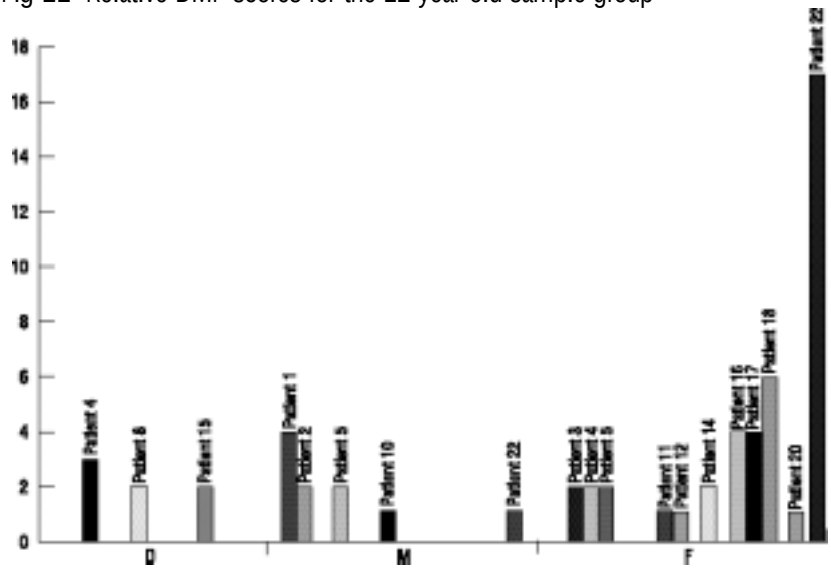


Fig 12 Average dmf scores for the 5 year old sample group

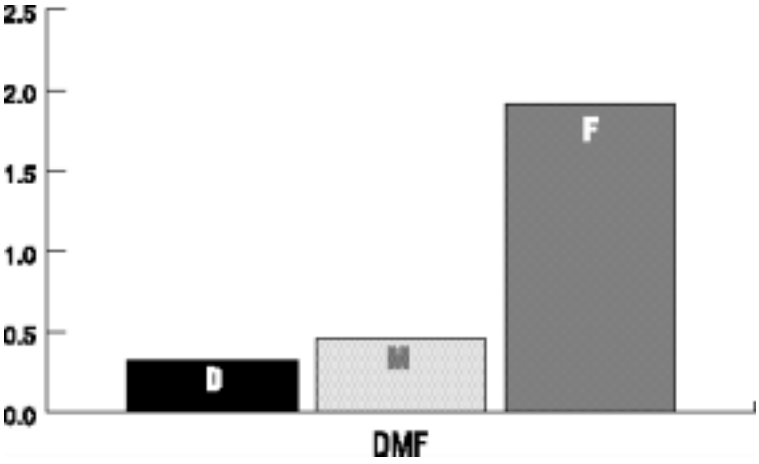


Fig 13 Total numbers of males and females for the 12 year old sample group

Health Education department for the education of children and parents.

Though some erosion scoring systems are being investigated for their suitability, as yet, no formalised facility exists for the charting of erosion lesions within the oral examination charting system at the RCH. Erosion lesions are currently recorded by annotation within the notes of the dental records, and of the forty-four children within the sample group, only one child had erosion lesions charted.

There are no differences in the delivery of treatment, care or treatment priorities between children from the indigenous communities and those of the non-indigenous communities. All eligible cases are seen and assessed by the principle dentist of the department and are placed on a waiting list for the relevant speciality with priority given to urgent cases.

Reference

1. Martin, Elizabeth. A Oxford Concise Colour Medical Dictionary 2nd Ed. Bath, Oxford University Press, 1998

Colgate survey on toothbrushes – ANZSPD 2001

Eighty seven members of the ANZ Society of Paediatric Dentistry responded to the Colgate survey on toothbrushes enclosed with the last edition of Synopses. Thank you to all those who responded. A cheque for $870 ($10 for each completed survey) will be sent to the President of ANZSPD. A summary of the key findings from the survey is given below.

57% of respondents were female. 41% of respondents were in the 35-44 years age group; 20% were less than 35 years of age and 38% were above 44 years of age. 51% are in private practice only and 33% practise only in the public sector. 15% practise in both the private and the public sector.

Manual Toothbrushes (66%) are the main type of toothbrush being used personally by these practitioners. Of the manual toothbrushes being used, Colgate is the main brand that is being used (37%). Conversely, those practitioners personally using powered toothbrushes (26%) are mainly using Oral B Braun (17%).

The brands and types of toothbrushes that practitioners are recommending to patients, closely reflect what they are currently personally using. Colgate Manual Toothbrushes (35%) receive the highest amount of recommendation to patients, followed by Oral B Powered Toothbrushes (18%).

Overall, there are many similarities in the reasons why both Manual and Powered Toothbrushes are recommended to patients. Functional features of the toothbrush are the main reasons for recommendation eg: bristle, handle and handle design. Additional reasons that are stated by practitioners who recommend a Powered Toothbrush over a Manual Toothbrush are: ease of use, superior cleaning efficacy to a manual toothbrush, durability, and encourages patient compliance without having to worry about individual techniques.

52% of practitioners believe there is an advantage in personally using a Powered Toothbrush. Primary reasons being:

- Better clean than a manual brush – small head; better reach to back teeth
- Easy to use – less effort

Nearly all practitioners (89%) believe that there is an advantage in their child patients using a Powered Toothbrush. Primary reasons being:

- Encourages brushing – fun to use
- Easy to use – less effort; best result for time required
- Better Clean than a manual brush – dexterity not required; small head

The main responses on features of Powered Toothbrushes that are LIKED by respondents include:

- Head size, small, light and practical 15%
- Easy to operate and good for getting to hard to reach places 12%
- Aesthetic design – attractive handle, bright colours 9%
- Soft bristles – prevents scrubbing 8%

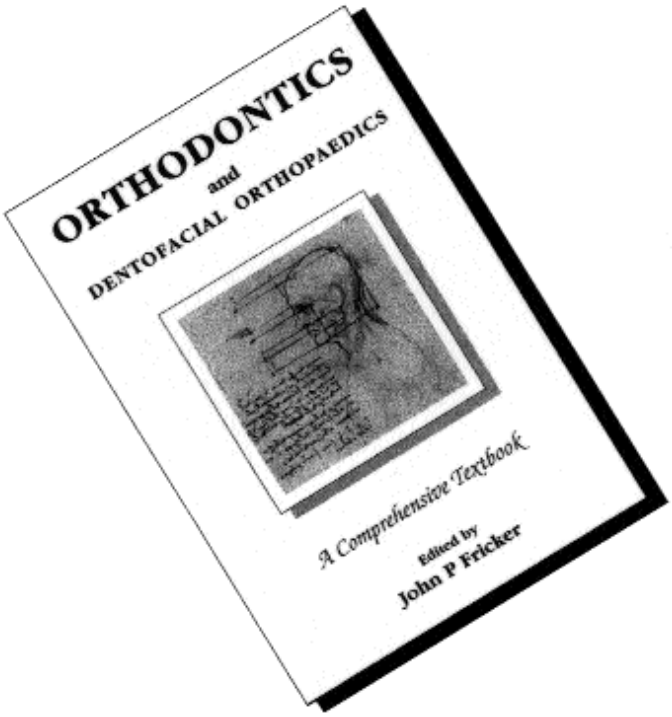
The main responses on features of Powered Toothbrushes that are DISLIKED include:

- Battery powered – runs out, not as good as rechargable 14%
- Too vigourous for some – vibrations 10%
- Too heavy for children 9%

70% of respondents had read clinical literature/studies relating to Powered Toothbrushes. 62% of those practitioners who had read literature claimed that they now had a better opinion of Powered Toothbrushes, whilst 36% remained unchanged.

83% of practitioners currently sell toothbrushes through their practices. The main brands of toothbrushes currently being sold are:

- Colgate Manual 22%
- Oral B Manual 19%
- Oral B Powered 13%
- Colgate Powered 8%



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Amelogenesis Imperfecta: from pedigree to practice

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Postgraduate candidate in paediatric dentistry, School of Dental Science, The University of Melbourne and Honorary Dental Officer- The Royal Children's Hospital, Melbourne.

Clinical supervisors: Dr CB Olsen and Professor M Aldred

Introduction

Amelogenesis Imperfecta (AI) may be defined as a heterogeneous group of genetic disorders affecting the enamel of the teeth and causing various degrees of hypoplasia, hypomineralization, or a combination of the two (Aldred and Crawford, 1995). The prevalence of AI as noted in the literature ranges from 1:14 000 in Michigan, USA (Witkop, 1957) to 1:718 in a Swedish study (Backman and Holm, 1986). The American figures are the most widely accepted as the Swedish study was undertaken in an isolated population. The Swedish population had few new members entering the community, therefore the trait was kept within the population and spread more easily. Genetic diversity was not present in the Swedish community as there was a limited gene pool and therefore, the phenotype was expressed more frequently. This situation is rarely found in communities today as people of many cultures and backgrounds come together, creating genetic diversity.

Classification

The most widely accepted classification of AI is that developed by Witkop in 1988 (Witkop, 1988) In this system, AI is classified into four main categories: hypoplastic, hypomaturation, hypocalcification and hypoplastic-hypomaturation with taurodontism. These variants are further divided into 14 subcategories based on clinical, histopathologic, roentgenographic and genetic characteristics. More recently it has been noted that variable phenotypes are found within families and within different teeth of the same person (Aldred and Crawford, 1995). This has led to the proposal of a new classification system that would be based on phenotype and include the molecular defect, biochemical composition and mode of inheritance (Aldred and Crawford, 1995). As the specific molecular defects have yet to be isolated, this classification system is not practical for clinical and diagnostic use at present.

Under the Witkop classification, Type I AI is the hypoplastic variant. This represents 60-73% of all cases, with males being affected more frequently than females. The radiodensity of the enamel appears normal although there is an insufficient quantity. Clinically, the enamel may be rough, smooth, pitted or grooved (Witkop 1988, Seow 1993, Hall 1994, Takagi 1998).

The second type is the hypomaturation variant. This represents 20-40% of all cases, with males being affected more often than females. The radiopacity of the enamel is similar to that of dentine and the enamel tends to chip away from the dentine. Clinically the enamel is mottled brown-yellow with localised or diffuse opacities. (Witkop 1988, Seow 1993, Hall 1994, Takagi 1998).

The hypocalcification variant is the third type of AI. This type represents 7% of all cases. Radiographically the enamel is less opaque than dentine. The enamel thickness is initially normal, but the enamel is soft and is easily removed soon after tooth eruption. Clinically there is poorly calcified enamel that may be light yellow-brown in colour.

The final type is the hypoplastic-hypomaturation variant with taurodontism. Defects are seen in both apposition and histodifferentiation of the enamel matrix. The enamel is mottled, yellow-brown and pitted. The molar teeth exhibit taurodontism and other teeth have enlarged pulp chambers (Witkop, 1988; Seow, 1993; Hall, 1994; Takagi, 1998).

Taurodont literally means “bull’s tooth” and is a term used to describe teeth with enlarged pulp chambers. In affected multi-rooted teeth the distance from the cemento-enamel junction to the bifurcation of the root is greater than the total length of the root (Cameron and Widmer, 1997). Affected molar teeth appear to have short roots.

Associated Syndromes

There are many syndromes that have been associated with AI, including: amelo-onycho-hypohidrotic syndrome, Morquio syndrome, Kohlschutter syndrome, amelogenesis imperfecta and nephrocalcinosis syndrome, tricho-dento-osseos syndrome (TDO), amelogenesis imperfecta with taurodontism, oculo-dento-osseous dysplasia and epidermolysis bullosa hereditaria (Hall 1994, Hall et al., 1995). Thorough clinical examination and history-taking will ensure that any syndromal associations are recognised, aiding in accurate diagnosis.

Principles of Management of Amelogenesis Imperfecta

The aims of management are to maintain the maximum amount of dental and osseous hard tissue, including alveolar bone, and to prevent loss of vertical dimension until the patient reaches an age when fixed prosthetic techniques may be employed. In the short term, it is essential to relieve tooth sensitivity and improve dental aesthetics (Hunter and Stone, 1997).

It is generally accepted that the rough enamel and large areas of exposed dentine may predispose affected teeth to increased levels of plaque retention and caries susceptibility (Seow, 1993a; Rosenblum, 1999). Preventive considerations should include regular fluoride treatments (professional and home applications), chlorhexidine mouthrinses, sealants, fluoride-containing restorative materials, dietary monitoring and regular reviews. The preventive regime should be formulated on an individual basis taking into consideration the type of AI. For example, chlorhexidine mouthrinses may cause excessive staining of affected teeth in individuals with hypomineralised variants of the condition. Similarly, bis-GMA based sealants may not adhere well to hypomineralised enamel.

Managing Amelogenesis Imperfecta in the Primary Dentition

Loss of tooth structure in the primary dentition can lead to space loss and crowding in the permanent dentition. Excessive wear may lead to loss of tooth vitality and result in extraction. These factors may be simply addressed through the use of full coverage restorations. The anterior primary teeth are generally restored with strip crowns (Unitek® Pedo Strip Crown Forms, 3M Dental Products, St Paul, Minnesota USA) containing composite resin, or glass ionomer cement or composite veneers. Stainless steel crowns with composite resin facings have been used also (Croll, 1998).

The posterior teeth are generally restored with stainless steel crowns. Orthodontic rubber separators may be used a few days prior to the restorative visit to separate the teeth and to obviate the need for interproximal reduction. Glass ionomer cement is used as the luting agent. Amalgam is not recommended as a restorative material as the weak tooth structure at cavosurface margins tends to chip away. This leads to accumulation of plaque and food debris, allowing secondary carious lesions to begin at the margins of the amalgam restorations. This, coupled with the loss of dental hard tissue, weakens the tooth structure, causing space loss in either the vertical dimension or arch length.

The choice of restorative material is dependent upon the type of amelogenesis imperfecta. Enamel acid etch patterns may be atypical, reducing the likelihood of successful bonding (Seow and Amaratunge, 1998). Where localized enamel defects occur, as in the case of lyonisation in x-linked amelogenesis imperfecta, adhesive restorative materials may be adequate as the enamel is of normal quality, but reduced in quantity. Cases such as the hypoplastic-hypomaturation variant require a more aggressive approach to management as significant amounts of tooth structure can be lost in a short period of time. Classisfication of the type of AI is therefore important in treatment planning and case management.

Managing Amelogenesis Imperfecta in the Permanent Dentition

In the permanent dentition, aesthetics are paramount to allow normal development and promote good self-esteem. Permanent restorations may not be able to be placed immediately, due to the immaturity of the periodontal contours. In these cases, aesthetic anterior temporaries may be fabricated from preformed poly-carboxylate or acrylic crowns. Composite resin restorations, or alternatively pre-veneered stainless steel crowns may be placed (Venezie et al., 1994; Rosenblum, 1999). When dental and facial growth and development are complete permanent restorations may be considered, and referral to a prosthodontist would be advisable. At this time the aesthetic expectations of the patient may be assessed and restorative treatment may involve veneers or full metal ceramic crowns (Williams and Becker, 2000).

Posterior teeth prove to be the most challenging to restore. Intracoronal restorations are generally unsuccessful due to the breakdown of the surrounding poorly mineralized tooth structure. Small restorations, however, may be completed with glass ionomer cement or composite resin. Full coverage restorations are the most effective. Adhesive cast restorations may be placed in supraocclusion to preserve tooth structure and restore vertical dimension that has been reduced through loss of surface enamel (Seow 1993a, Hunter and Stone, 1997). These cast restorations may be completed with minimal tooth preparation and would be advisable in hypoplastic variants of AI.

Case Report

A six year old male, BM, was referred to the Postgraduate Paediatric Dentistry clinic at the Royal Dental Hospital of Melbourne from a private dental practice regarding his AI. He has one younger brother, four years of age (DM). The medical history was unremarkable, and did not include systemic features of any of the AI-related syndromes. He was 134cm tall and weighed 28kg, placing him well above the 90th percentiles for his age.

BM was born at full term via breach delivery in Melbourne. His father is of Northern Italian descent. His parents moved from Sydney to Melbourne prior to his birth. BM's father "lost a lot of teeth early and wears a denture". His remaining mandibular anterior teeth are described as being "stained". The private dentist had noted that DM may also have "thin enamel". BM's mother recounted that a relative visiting from Italy seemed to have "very small teeth and heaps of them", reminding her of the teeth of her husband.

Dentally, BM was brushing his teeth himself with an electric toothbrush. He complained of sensitivity on his molar teeth only with brushing. His oral hygiene was excellent and no caries was detected. He was in the early mixed dentition. Thinning of the enamel was evident on the primary teeth. The teeth affected most were the second primary molars, followed by the first primary molars. No colour changes were evident in the primary dentition; however, the first permanent molars were yellow-brown in colour and were deficient in the quantity of enamel. Auditory evaluation of the surface texture indicated that it was rough and the enamel quality was judged to be hard.

BM had a convex facial profile with a high lip line. He had a class II skeletal tendency and was mesofacial. The first permanent molars were in a full Class II relationship. His overjet was 3mm and overbite 3mm (90%). Wear facets were evident anterior to the first primary molars in both the maxilla and the mandible.

Radiographic evaluation of BM showed a full complement of developing permanent teeth. The teeth generally were deficient in the quantity of enamel. The first permanent molars and second primary molars exhibited taurodontism and the primary canines had enlarged pulp chambers. An orthopantomograph radiograph of his sibling, DM showed that he also was deficient in the quantity of enamel on all teeth. Taurodontism was evident in his primary and developing permanent dentition, particularly in the single-rooted primary canines and the developing first permanent molars. This allowed establishment of the diagnosis of hypoplastic amelogenesis imperfecta with taurodontism, affecting both brothers in the family.

Pedigree

A pedigree is a pictorial display of past generations representing the transmission of genetic traits throughout the family. Males are represented with squares and females by circles. Generations are numbered with Roman numerals and individuals within generations are numbered with Arabic numerals. The affected individual is referred to as the proband and an arrow is used to indicate this patient. Other affected individuals or carriers are shaded on the pedigree and symbols for suspected affected individuals may be crosshatched. Clinical investigation must be able to support the diagnosis in affected individuals.

The pedigree for BM showed the affected individuals (Fig 1). On the far right is the relative visiting from Italy who may be affected by AI. This pedigree demonstrates an autosomal dominant form of hypoplastic amelogenesis imperfecta with taurodontism, which corresponds to the Witkop Type IV classification.

Treatment Plan

An orthopantomograph radiograph, clinical photographs and impressions for working and study models were taken. A preventive visit was undertaken prior to a general anaesthetic, where stainless steel crowns were placed on four primary molar teeth (55, 65, 75 and 85) and four permanent molar teeth (16, 26, 36 and 46). The crowns used to restore all of these teeth were primary molar crowns (Ion® Ni-Chro Primary Molar Crowns, 3M Dental Products, St Paul, Minnesota USA). Prior to the anaesthetic, stainless steel crowns were fitted onto a working model to reduce the anaesthetic time. Separators were not placed prior to the restorative visit as there was already sufficient spacing present within the dentition. At the one week post-operative review, the crowns were firmly in position and BM had made no complaints to his mother. He reported that he no longer had sensitivity on brushing. Oral hygiene was still excellent.

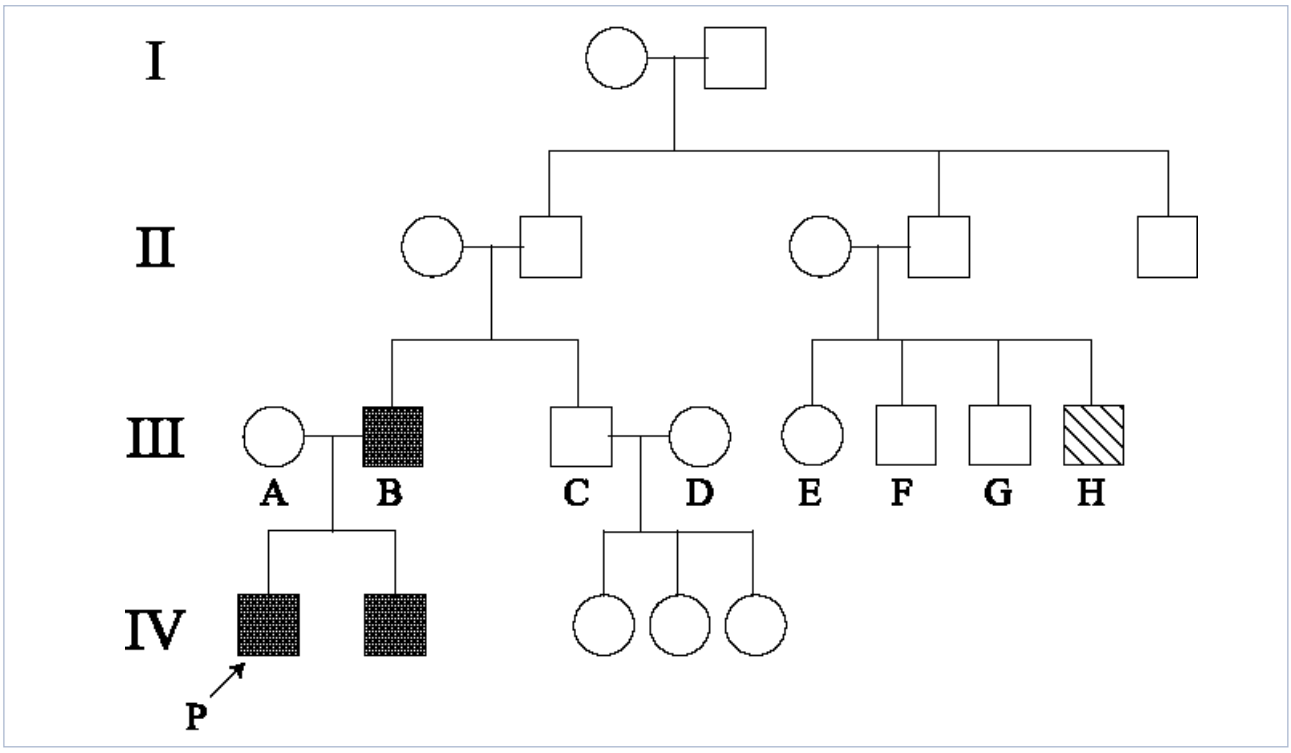
Reviews will be undertaken at six-monthly intervals. As the permanent anterior teeth erupt, it is proposed that composite resin will be used to cover the exposed enamel. Composite resin will be the material of choice for aesthetics, as there appears from the radiographs to be sufficient enamel for bonding. Regular fluoride treatments will be undertaken and home use of a fluoride mouthrinse will be encouraged further into the mixed dentition when more restorations are in place. In the long-term, the management aims are to preserve enamel and refer for orthodontic and prosthodontic management as required.

Discussion

The prognosis for BM is good, due to the fact that he has good quality of enamel. The clinical condition has been addressed at a relatively young age, prior to excessive occlusal wear on the primary molars and the newly-erupting permanent teeth. As a result, both brothers will benefit from early diagnosis and management and they should not experience the multiple extractions that their father had at a relatively young age. If complex orthodontic treatment is required, the restorations will need to be reviewed carefully to ensure that the restorations are of suitable quality and size for the long-term aesthetic and prosthodontic management.

Current literature pertaining to AI is focusing on molecular genetics (Hu et al., 2000; Hart et al., 2000). Mutations have been discovered for both the x-linked and autosomal dominant forms of AI (Kindelan et al., 2000). Interest

Fig 1 Pedigree of BM



has now developed in the protein, enamelin. Enamelin has been mapped to human chromosome 4q21, which is within the locus for the autosomal dominant form of AI (Dong et al., 2000). This highlights the changes that are being made to the traditional approach to diagnosis. No longer is clinical appearance, or phenotype, the definitive criterion. With advances in the field of molecular genetics the specific biochemical basis of conditions is being established. In time this will lead to specific diagnostic tests for not only amelogenesis imperfecta of the hypomaturation-hypoplastic type with taurodontism (AIHHT), but all types of AI. Once the specific molecular genetic causes of AI have been established, future advances will no doubt lead to very specific modes of treatment, including early diagnosis and interceptive management.

Taurodontism may be found as an isolated dental anomaly or in combination with other conditions such as AI. The prevalence of taurodontism within the adult Caucasian population is estimated to be 2.5% (Jaspers and Witkop, 1980). Controversy has centred around whether AIHHT and the tricho-dento-osseous syndrome (TDO) are distinct conditions, or conditions forming a spectrum of the disease (Crawford and Aldred, 1990). Both AIHHT and TDO are highly penetrant autosomal dominant conditions. Unlike AIHHT, TDO has a variable clinical phenotype with changes being found in the hair and bones. The prevalence of taurodontism of the first permanent molars in several large TDO families has been found to be highly variable (Wright et al., 1997). It has been postulated that several cases that had been reported as AIHHT were either misdiagnoses of TDO or incidental, and in no way related to the AI disorder, suggesting that AIHHT is not a specific AI condition (Seow, 1993b). One study has found the prevalence of taurodontism in AI (9/23 cases; 39%) to be similar to their unaffected relatives (10/24 cases; 42%) (Collins et al., 1999). These figures exceed those described for the Caucasian population (Jaspers and Witkop, 1980). However, this very small, non-random, convenience sample does not allow comparison to be made with the general population and also does little to disprove the existence of AIHHT as a clinical condition.

Clinical diagnosis may at times be subjective, however, with the advancement of molecular genetics, specific tests will become available to distinguish effectively between conditions with overlapping clinical phenotypes. In this case, a genetic test could help evaluate whether an individual exhibiting AI and taurodontism has TDO or AIHHT. The genetic basis of TDO has been identified recently as a deletion mutation in the distal-less 3 (DLX3) transcription factor gene (Price et al., 1999). Mutational analysis and sequencing studies of the DLX3 and DLX7 (the linked paralogue to DLX3 on chromosome 17), have suggested that AIHHT and TDO are two genetically distinct conditions (Price et al., 1999).

The brothers in the present case report have not been able to benefit fully from the advances in molecular science in relation to DNA testing and AI. Fortunately, they have been diagnosed with their conditions early and will benefit from early management. Their family has kindly entered into a research program for AI that is based at the Royal Children's Hospital, Melbourne, Australia. In time they may be able to contribute to scientific advances in the diagnosis and understanding of the molecular disturbances in their variant of AI.

Acknowledgements

The family members, BM, DM and their father, are warmly acknowledged for their participation in this report and for their ongoing commitment to the management and research into AI.

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30th Australian Dental Congress

The ANZSPD Early Childhood Caries theme symposium sponsored by Colgate Oral Care was held during the recent 30th Australian Dental Congress on 7 May. Our capable secretary manager, Dr Alistair Devlin, chaired the proceedings. The program featured presentations by four members: Drs Kim Seow, Kerrod Hallett, Nicky Kilpatrick and Louise Brearley-Messer. Delegates from all Australian states and New Zealand were given an opportunity to update their knowledge in the areas of biological mechanisms, social and behavioural determinants, hospital management and the public health perspectives and prevention aspects of this childhood disease. Judging from the large audience and the positive feedback, the symposium was well received and provided members with a valuable learning experience and helped to highlight the importance of children's oral health within congress.

Pictured are Drs Devlin, Hallett and Seow following the morning tea break during the proceedings.

Coming events

- R.K. Hall International Visiting Guest Lecturer, Professor Luc Martens. Auckland 29 & 30 October 2001, Christchurch 31 October 2001, Hobart 3 November 2001, Sydney 5 November 2001, Perth 8 November 2001. Contact local Branch Secretaries.
- 80th IADR / AADR / CADR General Session. San Diego, USA. 6-10 March 2002 Contact: Gwynn Breckenridge. International Association of Dental Research, Central Office. 1619 Duke Street, Alexandria. Virginia 22314-3406 USA gwynn@iadr.com
- European Academy of Paediatric Dentistry, Trinity College Conference Centre, Dublin, Ireland. June 15-17, 2002 Themes "The child with respiratory disease", "Mineralisation defects of perm-anent first molars", and "Fissure caries". info@conferencepartners.ie.
- American Society of Dentistry for Children Annual Conference, Westin La Paloma, Tucson, AZ, USA. September 25-29, 2002. Information: American Society of Dentistry for Children, 312-943-1244.
- 90th FDI Annual World Dental Congress. Vienna, Austria. 1-5 October 2002 Contact: Ms Suzy Price. FDI World Dental Federation. Congress & Exhibition. 7, Carlisle Street, London, England W1V 5RG, UK congress@fdi.org.uk
- International Federation of Dental Anaesthesiology Societies' Conference. Glasgow, Scotland. June 3-6, 2003 glasgow@concorde-uk.com
- IAPD 19th International Congress. "Dentistry for Children and all that Jazz" New Orleans 16-19 October, 2003. Hilton New Orleans Riverside Contact: American Society of Dentistry for Children 211 E. Chicago Avenue Suite 710 Chicago IL60611 USA asdckids@aol.com
- 20th IAPD International Congress. Darling Harbour Convention Centre, Sydney, Australia 31 October – 5 November, 2005. Contact: Sue Butterworth, Senior Conference Manager. ICMS Australasia Pty Ltd GPO Box 2609 Sydney 2001 sueb@icmsaust.com.au

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